

MWI 8715.15

REVISION B

EFFECTIVE DATE: October 15, 2004

EXPIRATION DATE: October 15, 2009

---

# **MARSHALL WORK INSTRUCTION**

**QD01**

## **GROUND OPERATIONS SAFETY ASSESSMENT AND RISK MITIGATION PROGRAM**

**CHECK THE MASTER LIST at**

**<https://repository.msfc.nasa.gov/directives/directives.htm>**

**VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 2 of 34

### DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		2/14/00	
Revision	A	5/31/01	Document title changed to MSFC Safety Assessment Program; and rewrote document in its entirety.
Revision	B	10/15/2004	Document title changed to Ground Operations Safety Assessment and Risk Mitigation Program; and rewrote document in its entirety. This new document includes the content of the following documents: MWI 8715.6A Hazardous Operations, and MWI 8715.8A Operational Readiness Program, as well as the MWI 8715.15A, MSFC Safety Assessment Program. These documents will be deleted as a result of this revision. Format changed per HQ requirement review.

**CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 3 of 34

## 1. PURPOSE

This Instruction provides a systematic and objective process for identifying hazards and assuring their elimination or control.

## 2. APPLICABILITY

This Instruction applies to all facilities, equipment, materials, jobs, tasks, operations, and processes (referred to as operations throughout the remainder of the document) controlled by Marshall Space Flight Center (MSFC).

## 3. APPLICABLE DOCUMENTS

The applicable documents are listed below. The Universal Resource Locator (URL) for locating Occupational Safety and Health Administration (OSHA) documents is [www.osha.gov](http://www.osha.gov)

3.1 29 CFR 1910, "Occupational Safety and Health Standards"

## 4. REFERENCES

4.1 29 CFR 1910, "Occupational Safety and Health Standards"

4.2 MPR 8715.1, "Marshall Safety, Health, and Environmental (SHE) Program"

4.3 NASA-STD-8719.7, "Facility System Safety Guidebook"

4.4 NPR 8715.3, "NASA Safety Manual"

4.5 NPR 7100.8, "Protection of Human Research Subjects"

4.6 MPD 1150.1, Charter MC-04, "Institutional Review Board (IRB) for Human Research Tests"

4.7 NPR 1441.1, "NASA Records Retention Schedules" (NRRS)

## 5. DEFINITIONS

5.1 Accepted Risk. A hazard whose risk is not completely mitigated and has been accepted by program or project management and concurred with by Safety.

5.2 Corrective Action. An action taken to eliminate or control identified hazards in order to reduce the risk to personnel, equipment, and facilities.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 4 of 34

5.3 Dry Run. A trial run of a given system, test, operation, or setup to determine operational readiness.

5.4 Hazard. An existing or potential condition that can result in, or contribute to an injury, illness, death, or damage to systems, equipment, or facilities.

5.5 Hazard Analysis (HA). A method of identification and evaluation of existing and potential hazards and the recommended mitigation for the hazard sources found.

5.6 Hazardous Operation. Any operation involving material or equipment that has a high potential to result in loss of life, serious injury to personnel, or damage to systems, equipment, or facilities. Examples are operations that involve explosives, propellants, high pressure, oxidizers, corrosives, high elevations, cryogens, hostile atmosphere, flammables, high electrical energy, radiation, noise, hyperbaric or hypobaric environment, toxic material, and critical hardware.

5.7 Inhibit. A design feature that prohibits operation of a function.

5.8 Inventory of Hazardous Operations (IHOPS). A computer database to list identified hazardous operations on property controlled by MSFC.

5.9 Institutional Review Board (IRB) for Human Research Tests. Board to review human research activities with the primary responsibility for the safety of human research subjects.

5.10 Job Hazard Analysis (JHA). A method or process used to determine hazards associated with a specific job or task and their elimination or control, otherwise known as a Job Safety Analysis (JSA).

5.11 Operating Procedure (OP). A detailed plan listing step-by-step instructions to ensure safe and efficient operations.

5.12 Operational Readiness Inspection (ORI).

5.12.1 Level I. An inspection of new or significantly altered equipment, facilities, test activities or test operations where there is a significant degree of risk of accident or mishap which might cause personal injury or death, or where there is a high risk of serious damage to equipment, test articles, buildings, or adjoining areas. An ORI may also be performed to review high visibility or value projects, facilities, or operations.

5.12.2 Level II. Previously called Safety Review Team (SRT), is an inspection of equipment, facilities, test activities or test operations of a less hazardous nature, to review and inspect facility additions or modifications that result in a change in existing hazard levels, or to ensure that all hazards are identified and either eliminated, controlled, or the risk has been accepted. Reporting requirements are less stringent from the Level I ORI.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 5 of 34

5.13 Operational Readiness Inspection Committee (ORIC). A committee established to conduct the ORI. The ORIC consists of a chairperson, a recorder, and a minimum of three other members to assess all functional areas of the operation.

5.14 Personal Protective Equipment (PPE) Assessment. An assessment of the workplace or operation to determine if hazards are present, or likely to be present, which necessitates the use of PPE.

5.15 Residual Risk. Risk that remains from a hazard after all mitigation and controls have been applied.

5.16 Risk Assessment Classification (RAC). The RAC indicates the risk associated with each individual hazard. It is derived by considering both the severity and probability of a hazard.

5.16.1 Hazard Severity. The rating for the worst-case potential injury or system damage when an identified hazard results in an accident.

5.16.2 Hazard Probability. The likelihood that an identified hazard results in a mishap.

5.17 Risk Indicator (RI). An indicator used to help determine the level of system safety effort required to meet NASA safety requirements. The RI may also be referred to as the Facility Risk Indicator (FRI). RIs are defined below:

5.17.1 RI 1 (High Risk). A high probability that the hazards can cause loss of life. Hazards may result in loss of life, permanent disability, or serious occupational illnesses to one or more persons, three or more lost-time injuries, loss of facility operational capability for 1 month or greater, or damage to equipment or property in excess of \$500,000.

5.17.2 RI 2 (Medium Risk). A medium probability that the hazards can cause loss of life. Hazards may result in permanent disability to one or more persons, hospitalization (associated with illness or injury) of three or more persons, up to two lost-time injuries, loss of facility operational capability from 2 to 4 weeks, or damage to equipment or property from \$250,000 to \$500,000.

5.17.3 RI 3 (Low Risk). A low probability that the hazards can cause loss of life. Hazards may result in hospitalization to 1 or 2 persons, occupational injury or illness resulting in a lost workday or restricted duty case, loss of facility operational capability from 1 day to 2 weeks, or damage to equipment or property from \$25,000 to \$250,000.

5.17.4 RI 4 (Acceptable Risk). An unlikely probability that the hazard can cause a loss of life as a result of the hazards is unlikely. Hazards may result in no lost workday injuries or no

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 6 of 34

restricted duty cases, loss of facility operational capability of less than 1 day, or damage to equipment or property less than \$25,000.

5.18 Safety, Health, and Environmental (SHE) Committee. A Centerwide Committee to promote and improve the SHE Program. Membership is in accordance with MPD 1150.1, Charter MC-12, “MSFC Safety, Health, and Environmental (SHE) Committee.”

5.19 Safety Assessment (SA). A systematic process used to identify hazards and controls related to a given facility, equipment, job, task, operation, or process. It is also a generic term for a family of analyses performed at MSFC including, but not limited to JSA, HA, Failure Modes and Effects Analysis (FMEA), etc.

5.20 Supervisor. The person responsible for the welfare of the people performing the job or task being assessed (i.e. manager, foreman, group or team lead, etc.).

5.21 Test Readiness Review and Operational Readiness Review (TRR and ORR). Preoperational reviews of all risks associated with a specific hazardous test or operation to ensure test or operational objectives are met without property damage or personnel injury and to determine test, operational system, or test article readiness. A TRR or an ORR does not take the place of an ORI, but is used in conjunction with these reviews, if they are required.

## 6. INSTRUCTIONS

The safety procedures in this document are listed in the following order:

- 6.1 General Responsibilities
- 6.2 Safety Assessment Process
- 6.3 Risk Mitigation
- 6.4 Job Hazard Analysis (JHA)
- 6.5 Personal Protective Equipment (PPE) Assessment
- 6.6 Operation Procedures (OP)
- 6.7 Hazard Analysis (HA)
- 6.8 Operational Readiness Inspection (ORI)
- 6.9 Test Readiness Review and Operational Readiness Review (TRR and ORR)
- 6.10 Dry Runs
- 6.11 Inventory of Hazardous Operations (IHOPS)

### 6.1 General Responsibilities

#### 6.1.1 Directors and Managers shall:

6.1.1.1 Ensure that all operations under their control are adequately assessed and reviewed in accordance with this document to identify potential hazards and ensure proper hazard mitigation.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 7 of 34

6.1.1.2 Review residual risk all for operations and facilities under their control and either accept the risks, provide for additional mitigation techniques or reject the risks and the operation.

6.1.1.3 Review IHOPS submittals to ensure completeness and there are no duplications.

6.1.2 Supervisors shall:

6.1.2.1 Implement the safety assessment process for all operations under their control

6.1.2.2 Review safety assessments annually with their affected employees (excluding one time readiness reviews, i.e. ORIs, TRRs).

6.1.2.3 Implement and ensure that the PPE program complies with the requirements in section 6.5 of this document and MWI 8715.4, Personal Protective Equipment.

6.1.2.4 Ensure that hazardous operations are documented in the IHOPS database and updated at least annually.

6.1.2.5 Maintain configuration control for hazardous operations

6.1.3 Employees shall:

6.1.3.1 Be responsible for the safety of themselves, coworkers, and the property and operations assigned to them.

6.1.3.2 Have the authority to “stop work” if they see an unsafe act or condition.

6.1.3.3 Use the buddy system where the risk of hazard severity is either catastrophic or critical. The buddy serves as an observer to render assistance as required. When in doubt about when the buddy system is appropriate, contact Safety and Mission Assurance (S&MA) for assistance.

6.1.3.4 Be trained and certified for the job when performing a hazardous operation in accordance with MWI 3410.1, “Personnel Certification Program.”

6.1.3.5 Coordinate with the responsible organization to request permission prior to entry into a hazardous area.

6.1.3.6 Report injury or equipment damage in accordance with MWI 8621.1, Mishap/Incident Reporting and Investigation.”

6.1.4 S&MA shall:

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 8 of 34

6.1.4.1 Develop and maintain the MSFC Industrial Safety Assessment and Risk Mitigation Program, Marshall Work Instruction (MWI).

6.1.4.2 Assist supervisors, as required, in determining the appropriate level of safety assessment for any given operation.

6.1.4.3 Review and concur with the HA and OPs as defined in this document.

6.1.4.4 Provide a representative for ORI, TRR, and ORR activities.

6.1.4.5 Concur with closure of hazards identified in RI Level 1 and 2 operations. (specifically S&MA Industrial Safety Department engineers or management).

6.1.4.6 Perform or assist in performing safety assessments as requested by the responsible supervisor or as identified necessary by S&MA.

## 6.2 Safety Assessment Process

6.2.1 The safety assessment process shall be performed as follows:

6.2.1.1. Identify the operations to be assessed and make an initial RI assignment based on the definitions in section 5.17. Use worst case scenarios and consider all phases of the operation.

6.2.1.2. Determine the minimum level of safety assessment required using the following table:

**Table 6.2.1.2**

### **Minimum Level of Safety Assessment Activities Required**

Risk Indicator Level	ORI Level I	ORI Level II	TRR/ORR	HA	JHA	OP	Dry Run	PPE Assessment
RI 1	X		x	x		x	****X	x
RI 2		x	x	x		x		x
RI 3		*X	*X		**X	x		x
RI 4					**X	**X		***X

\* If determined necessary by the appropriate program/project office, the appropriate directorate or department management, or S&MA.

\*\* A JHA or an OP is required. (Reference Appendix Z)

\*\*\* A PPE assessment is not required for normal non-hazardous office environments.

\*\*\*\* If determined necessary by the appropriate ORI Level.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 9 of 34

6.2.1.3 If the operation has a RI level of 1, 2, or 3, enter the operation and associated assessments into IHOPS and maintain as long as the operation is active. Checklists are provided in IHOPS for help in performing specific assessments. Reference section 6.11.

6.2.1.4 Conduct the appropriate safety assessment prior to the start of any new or significant change or modification to any existing operation, per the following chapters and appendices for requirements and Appendix Z for additional guidance.

6.2.1.5 Review existing operations to ensure that all hazards have been identified and risks mitigated through performance of an adequate safety assessment or that sufficient rationale exists to justify alternate methods to satisfy the intent of this instruction.

6.2.1.6 For continuing operations, review safety assessments annually, IHOPS automatically notifies the responsible persons of annual review dates. Exception - For operations performed less frequent than annually, perform review prior to restart of the operation.

6.2.1.7 Update safety assessments to reflect any new hazards, operations, equipment, materials, chemicals and tools when introduced.

6.2.1.8 Ensure that employee training and operational procedures are updated to incorporate the findings of the safety assessment.

### **6.3 Risk Mitigation**

6.3.1 Hazard reduction strategies shall be in the order of precedence listed in Table 6.3.1.

TABLE 6.3.1

- |   |
|---|
| <ul style="list-style-type: none"> <li>a. Design to Eliminate Hazards</li> <li>b. Design to Control Hazards</li> <li>c. Provide Safety Devices</li> <li>d. Provide Warning Devices</li> <li>e. Provide Special Procedures or Training</li> <li>f. Hazard Acceptance or System Disposal</li> </ul> |
|---|

### **6.4 Job Hazard Analysis (JHA)**

6.4.1 At a minimum, a JHA shall be performed on all MSFC operations per table 6.2.1.2 using the process outlined in Appendix A. Exception - For operations that require a HA or OP per table 6.2.1.2, the JHA may be a part of that document as long as all the JHA requirements are covered.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 10 of 34

6.4.2 JHAs shall be easily accessible to the affected employees.

6.4.3 JHAs shall be reviewed at least annually. The annual civil service employee performance evaluation (reference MSFC-Form-4194) has a line item to remind supervisors to review JHAs with their employees.

## **6.5 Personal Protective Equipment(PPE) Assessment**

6.5.1 Each supervisor shall assure a PPE hazard assessment is performed, as required by Table 6.2.1.2, for the work area and the operations in their area of responsibility and PPE program implemented in accordance with the requirements of MWI 8715.4, Personal Protective Equipment (PPE).

6.5.2 An evaluation method shall be used to determine what type PPE is required in the work area or while performing the operation if employee exposure to a hazard cannot be eliminated, as follows:

- a. Define the work area or operation to be assessed.
- b. Identify the hazards or the potential hazards in the work area or for a particular operation.
- c. Determine the areas of the body or body systems that are affected by the hazard.
- d. Estimate the potential and/or frequency for employee contact with the hazard.
- e. Estimate the consequences of employee contact with the hazard in the area.
- f. Rank all identified hazards associated with the work area or operation by the amount of risk to the employee.
- g. Assign identified hazards with the highest amount of risk (loss of life, permanent disability, serious occupational illnesses, etc.) the highest priority for prevention or minimization.
- h. Select the appropriate PPE for the hazards and assure proper fit. Consider all risks, i.e. if both chemical and sharps are involved, select the PPE based on the hazard with the most risk and then select from that subset of PPE to cover the lesser risk also. Reference MWI 8715.4 for additional detail.
- i. Document the PPE Assessment to include the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and identify the document as a certification of hazard assessment. Decisions reached during the PPE hazard assessment and selection process shall be documented in a manner that records: identification of

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 11 of 34

location and/or process, operation, or task; identified hazard exposures; affected body parts and potential severity of injury or illness; affected employees by function or job title; and specifications for the corresponding selected PPE.

## **6.6 Operating Procedure (OP)**

6.6.1 Supervisors shall ensure OPs are developed prior to and used during operations in accordance with Table 6.2.1.2.

6.6.2 OPs for hazardous operations shall be reviewed and approved by the responsible supervisor with concurrence from the MSFC Industrial Safety Department prior to performance of the operation.

6.6.3 Nonhazardous OPs shall be approved by the person submitting the procedure, the persons responsible for that operation and the appropriate functional areas (as determined by the responsible manager).

6.6.3 OPs for hazardous operations shall be developed in accordance with Appendix B.

## **6.7 Hazard Analysis (HA)**

6.7.1 As required by Table 6.2.1.2, supervisors shall ensure that HAs are performed. Detailed information on conducting a HA is located in Appendix C.

## **6.8 Operational Readiness Inspection (ORI)**

6.8.1 An ORI Level I shall be conducted for all new or modified equipment, facilities, operations/processes, or test activities with an RI Level 1 - High Risk.

6.8.2 An ORI Level II shall be conducted for all new or modified equipment, facilities, operations/processes, or test activities with an RI Level 2 - Medium Risk.

6.8.3 An ORI Level II shall be conducted for equipment, facilities, operations/processes, or test activities with an RI Level 3 - Low Risk if determined necessary by the appropriate program/project office, directorate or department manager, or S&MA.

6.8.4 Supervisors shall identify operations requiring an ORI to their organizational Director.

6.8.5 The Director of the responsible organization shall select a Chairperson .

6.8.6 The ORI Chairperson and the director of the responsible organization shall establish functional membership and consultants.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 12 of 34

6.8.7 When any of these individuals have a vested interest in the facility or operation under review, rationale shall be provided for their selection.

6.8.8 A recorder shall be provided by the organization responsible for the operation under review.

6.8.9 S&MA shall provide a safety representative to serve as a consultant to the ORIC.

6.8.10 The ORI Chairperson shall prepare a management announcement for the director of the responsible directorate or office approval, which establishes the ORIC, identifies the functional membership of the ORIC, and provides the ORI schedule and reporting requirements, accompanied by rationale for, and recommendation of, any chairperson or members with a vested interest in the facility or operation under review.

6.8.11 The responsible organization shall provide a review plan to the ORIC that identifies the operational requirements of the operation.

6.8.12 The ORI Chairperson shall ensure that all ORI review activities are conducted. Appendix D describes the ORI activities.

6.8.13 The Director of the responsible organization and Institutional Review Board (IRB) for Human Research Tests, if required, shall perform the following:

6.8.13.1 Review status and evaluate the activities of the ORIC as they are assigned, and provide recommendations for additional activities as determined necessary.

6.8.13.2 Specify the degree of approval authority granted to the ORIC for activation milestone events.

6.8.13.3 Conduct a final review to evaluate and ensure adequacy of the total ORIC effort.

6.8.14 The OIRC or IRB if required, shall report the readiness of the operation as required by the management announcement and as stated below, and provide the data required to support restrictions and limitations to be imposed.

6.8.14.1 The ORI Level I shall report the readiness of the operation to the MSFC Director and obtain concurrence to proceed.

6.8.15 The ORI Level II shall report the readiness of the operation to the management level specified in the management announcement and S&MA and obtain concurrence to proceed.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 13 of 34

6.8.16 The responsible management shall re-establish the ORIC/ORI Level II or prepare a new announcement for new facilities being constructed in pre-announced phases over several years where ORIC/ORI Level II membership remains the same.

6.8.17 The ORIC shall note discrepancies and recommendations in writing.

6.8.18 The recorder shall assign a control number to each discrepancy and recommendation for future disposition.

6.8.19 Recommendations shall be deliberated in a meeting of the full committee.

6.8.20 The ORIC shall review proposed recommendations with appropriate operational personnel to ensure that recommendations are understood and that the ORIC has not acted on the basis of inaccurate or incomplete information.

6.8.21 The ORIC shall establish time or event deadlines associated with each recommendation or discrepancy.

6.8.22 The ORIC shall prepare a final written report. The responsible organization maintains the report for the life of the operation per NPR 1441.1.

6.8.23 The report shall be prepared in two parts as follows:

a. Part I - Executive Summary. Includes a copy of the management announcement establishing the ORIC, a brief summary of the activities (number of meetings, identification of the number of action items and status by ORIC), residual risks, conclusions, recommendations, and signature page for the ORIC members. Distribution includes the director of the responsible directorate/office, SHE (appropriate subcommittee members), Director, S&MA Directorate, IRB (if required), ORIC members, and affected program managers and directorate managers.

b. Part II - Supporting Data and Information. Includes minutes of meetings, presentation charts, directly related correspondence, and other information judged to be appropriate to support any future investigation or review.

6.8.24 S&MA shall review the ORIC final reports for completeness and forward to the responsible organization.

## **6.9 Test Readiness Review (TRR) and Operational Readiness Review (ORR)**

6.9.1 Supervisors shall ensure that TRRs or ORRs are conducted for operations, as required by Table 6.2.1.2, per the instructions located in Appendix E. The responsible manager or S&MA may also recommend a TRR or ORR based on the overall degree of potential risk to employees and equipment

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 14 of 34

6.9.2 TRRs and ORRs shall be conducted prior to but as close as possible to the start date of the test or operation being reviewed.

6.9.3 The responsible supervisor shall coordinate TRR and ORR activities with S&MA.

6.9.4 Major changes or modifications to the same operation shall be evaluated to determine the need to re-establish the TRR or ORR.

6.9.5 The TRR and ORR shall consist of representatives from the appropriate responsible organization's management structure, S&MA, test or operations requester, test or operation conductor or engineer, and functional offices as appropriate.

6.9.6 Managers of the responsible department shall appoint TRR/ORR members in coordination with the director of the responsible directorate/office and prepare an announcement that specifies TRR/ORR team members, scope of the TRR/ORR, approval authority granted to the TRR/ORR, and the TRR/ORR reports required to be presented at the completion of the evaluation.

6.9.7 The responsible manager shall choose the Chair and general team members.

6.9.8 A representative from the MSFC S&MA Directorate shall be a general team member.

6.9.9 If an ORIC has any actions to be addressed by the TRR or ORR, the Chair (or a member) of the ORIC shall be recommended to be a general team member.

6.9.11 When deemed necessary, representatives from other MSFC organizations (e.g., Center Operations Office or Engineering Directorate) and non-MSFC organizations shall serve as general committee members.

6.9.12 The TRR or ORR team shall prepare reports required by the announcement, which lists all discrepancies and recommendations noted, and has the approved of the affected manager and the S&MA Directorate.

## **6.10 Dry Runs**

6.10.1 Dry run instructions shall be determined by the appropriate level safety review team such as the ORI Level I, ORI Level II and TRR/ORR, management, or S&MA.

6.10.2 Dry runs shall be conducted for highly critical or extremely hazardous operations if determined to be necessary by responsible management or S&MA.

## **6.11 Inventory of Hazardous Operations (IHOPS)**

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 15 of 34

6.11.1 All operations determined to be an RI 1, RI 2, or RI 3 shall be listed in the IHOPS data base.

6.11.2 The following applicable data shall be entered into IHOPS:

- The hazardous operation being performed.
- The location of the hazardous operation.
- MSFC supporting and submitting organizations.
- Number of personnel supporting this hazardous operation.
- The Risk Indicator (RI) Level.
- The documentation necessary to control the hazard (i.e., a JHA, OP, HA, etc.)
- Safety Assessment dates, titles, and records point of contact (POC).

6.11.3 The Supervisor or designated POC shall conduct an annual review to ensure that the IHOPS for his or her area of responsibility is current.

6.11.4 S&MA Industrial Safety Department/QD50 shall appoint a Reviewer for all hazardous operations. Each S&MA Reviewer is assigned to hazardous operations according to RI level, and building number or by the Submitting Organization of the hazardous operation.

6.11.5 The S&MA Reviewer shall review, approve, or reject the hazardous operation submittal.

6.11.5.1 Rational for rejection shall be forwarded to the submitter.

6.11.6 The IHOPS database shall comply with the NASA requirement to keep a current list of all hazardous operations at MSFC.

## 7. NOTES

None

## 8. SAFETY PRECAUTIONS AND WARNING NOTES

Safety precautions and warning notes shall be specific to the facility, equipment, job, task, operation, or process analyzed. For example, the OP contains a similar step: “**CAUTION** – When performing a drilling operation, eye protection shall be worn.”

## 9. RECORDS

9.1 JHA

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 16 of 34

9.1.1 JHA records shall be maintained by the organization performing the assessment in accordance with the NRRS 1/119.X (A) [1710] for the length of time activity is performed then destroyed when no longer needed for reference.

9.1.2 MSFC Form 4390 or equivalent shall be used. See Appendix A.

9.2 PPE Assessment records shall be maintained by the organization performing the assessment in accordance with the NRRS 1/119.X (A) [1710] for the length of time activity is performed then destroyed when no longer needed for reference.

9.3 OPs shall be maintained by the organization performing the assessment in accordance with the NRRS 1/119.X (A) [1710] for the length of time the OP is applicable then destroyed when no longer needed for reference.

9.4 Configuration control drawings for hazardous facilities shall be maintained by the organization performing the activity in accordance with the NRRS 1/72 (E) [1410] for the length of time the activity is in operation then destroyed when no longer needed for reference or maintained for historical purposes.

9.5 Documented approvals of risk shall be maintained by the organization performing the activity in accordance with the NRRS 1/6 (C) [1050] for the length of time the activity is in operation then destroyed when no longer needed for reference or maintained for historical purposes.

9.6 HAs and supporting analyses such as FMEAs, Fault Trees, etc. shall be maintained by the organization performing the assessment in accordance with the NRRS 1/119.X (A) [1710] for the length of time the OPE is applicable then destroyed when no longer needed for reference

9.7 ORI records shall be maintained by the organization performing the assessment in accordance with the NRRS 1/119.X (A) [1710] for the length of time the activity is performed plus 5 years then destroyed when no longer needed for reference.

9.8 TRR/ORR records shall be maintained by the organization responsible for the operation in accordance with the NRRS 1/119.X (A) [1710] for the length of time the operation is performed then destroyed when no longer needed for reference.

9.9 IHOPS shall be maintained by S&MA in accordance with NRRS 1/119.X (A) [1710] for the length of time the operation is performed then destroyed when no longer needed for reference.

9.10 Training Records

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 17 of 34

9.10.1 Completion of recommended safety training shall be documented and maintained in accordance with NRRS 3/33 (G.2) [3400] by the Employee and Organizational Development Department for the length of employment, then destroyed or maintained for historical purposes.

9.10.2 Personnel certification records shall be maintained in accordance with MWI 3410.1, "Personnel Certification Program" and NRRS3/33 (G.2) [3400] for the length of employment then destroyed when no longer needed.

## **10. PERSONNEL TRAINING AND CERTIFICATION**

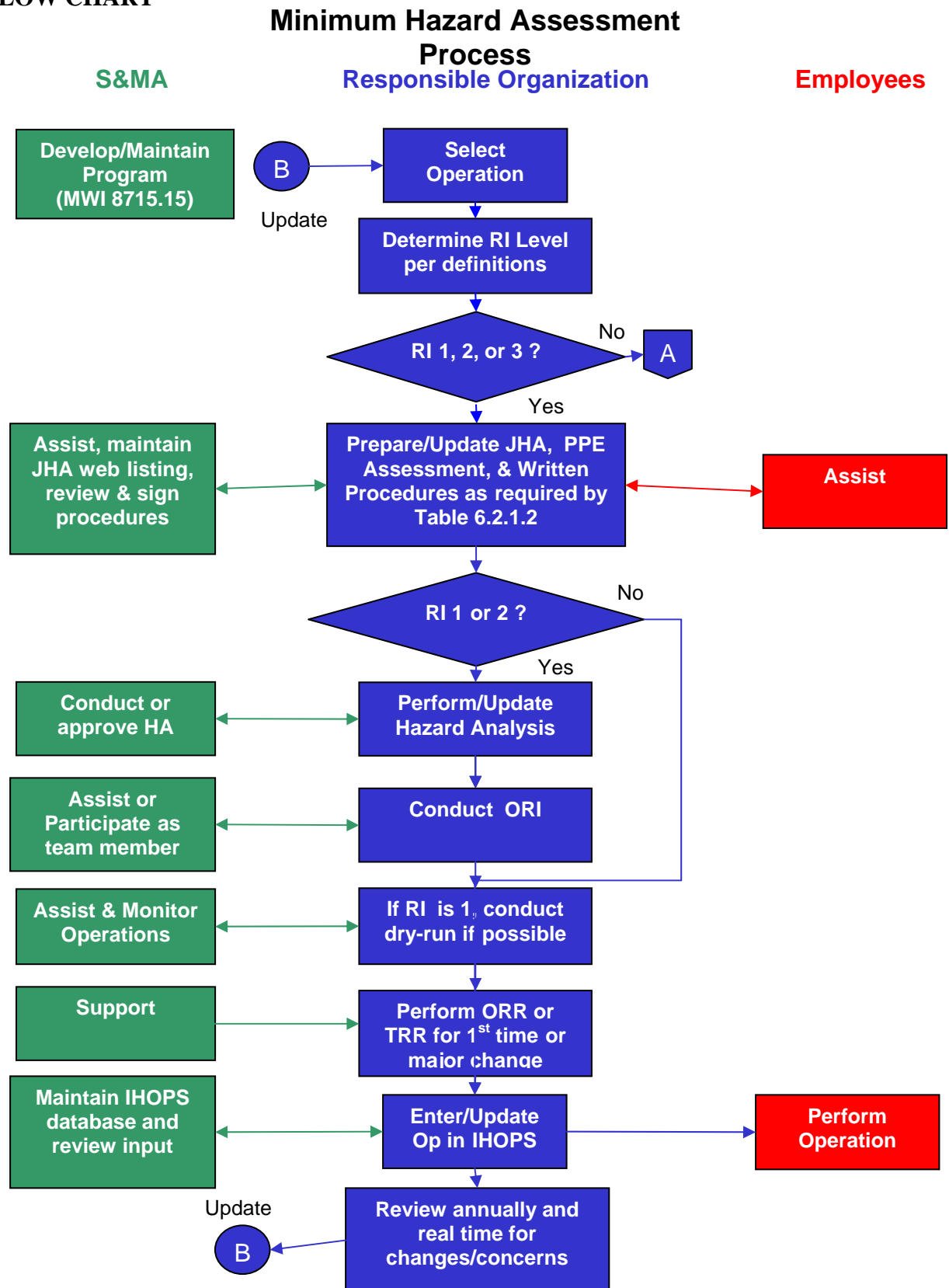
10.1 Supervisors shall train their employees on the hazards and controls documented in their JHAs or sustaining operating procedures annually.

10.2 Supervisors and employees performing safety assessments in accordance with this instruction shall attend NSTC or equivalent courses relevant to their assigned jobs as directed by their management, to gain knowledge of applicable safety assessment and safety-related work practices. See Appendix Z for a listing of available courses.

10.3 Although there are no required personnel certifications specific to safety assessment, certifications relating to specific hazards shall be obtained and maintained in accordance with MWI 3410.1, "Personnel Certification Program."

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 18 of 34

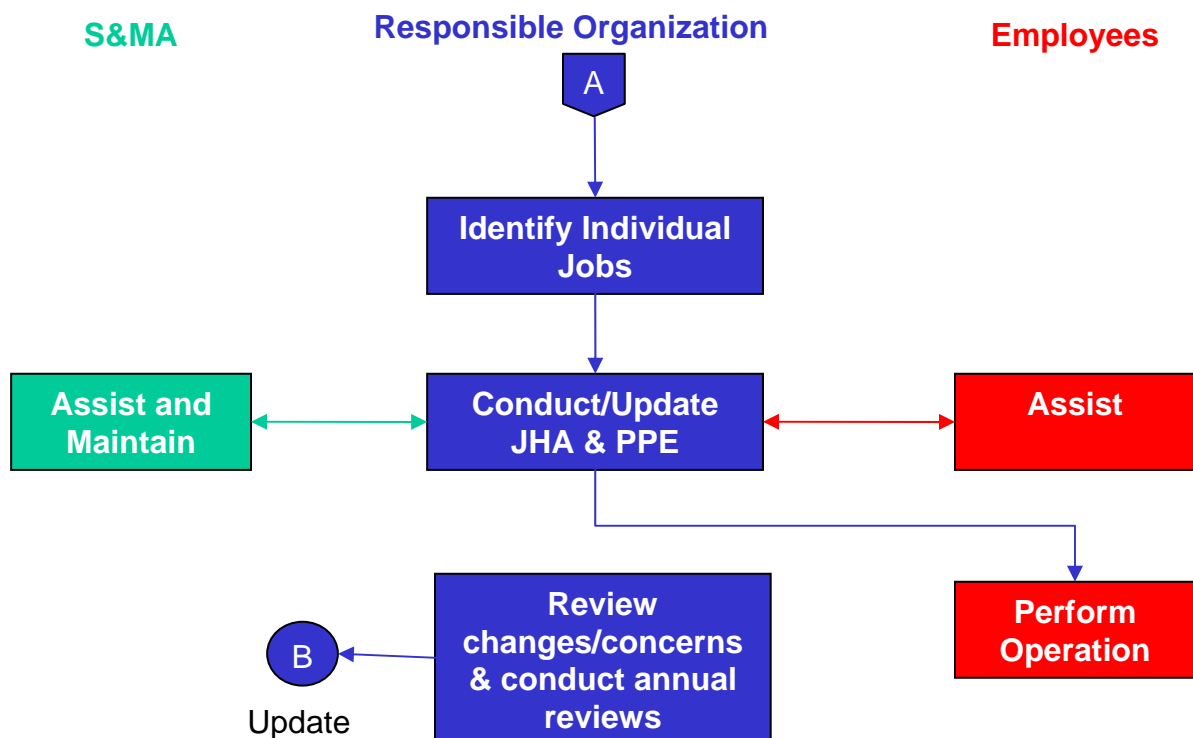
## 11. FLOW CHART



CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
 VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 19 of 34

## Minimum Hazard Assessment Process (RI 4 Operations)



## 12. CANCELLATION

MWI 8715.6A, “Hazardous Operations,” dated June 25, 2001; MWI 8715.8A, “Operational Readiness Program,” dated June 25, 2001; and, MWI 8715.15A, “MSFC Safety Assessment Program,” dated May 31, 2004.

Original signed by  
Robin N. Henderson for

David A. King  
Director

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 20 of 34

## Appendix A Job Hazard Analysis (JHA) Preparation

A.1 When preparing to conduct a JHA of their responsible work area, supervisors shall consider the following questions:

- (1) Which operations have the highest injury or illness rates?
- (2) Which operations have the highest close call rates?
- (3) Have any new operations been added or existing operations changed that require a new JHA?
- (4) What are the environmental conditions where the operation is performed?
- (5) What are the physical requirements of the operation?
- (6) What are the basic operation steps?
- (7) What are the potential accidents or hazards associated with each step?
- (8) How are these hazards controlled (engineered away, warning alarms, personal protective equipment, procedural controls)?

A.2 When developing a JHA, the following steps shall be considered: (There are several ways to accomplish this, but the method proven most reliable is the observation and team approach.)

- (1) Select the most experienced employee to observe.
- (2) Explain the purpose of your observations.
- (3) Observe the job/task and define the steps used to complete the assignment.
- (4) Review the steps with the observed employee for clarity.
- (5) Observe the job/task a second time and identify any hazard potentials and record the findings. The hazards may include, but not limited to, the following:
  - (a) Impact
  - (b) Contact with chemicals
  - (c) Caught on or between
  - (d) Fall or Slip
  - (e) Over exertion
  - (f) Cumulative Trauma
- (6) Observe the employee a third time to develop corrective measures to all hazard potentials.
- (7) Review your findings with the employee for clarity.
- (8) Complete the JHA form, MSFC Form 4390 (see below).

**CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

<p align="center"><b>Marshall Work Instruction</b> <b>QD01</b></p>		
<p><b>Ground Operations Safety Assessment and Risk Mitigation Program</b></p>	<p><b>MWI 8715.15</b></p>	<p><b>Revision: B</b></p>
	<p><b>Date: October 15, 2004</b></p>	<p><b>Page 21 of 34</b></p>

**Table A.2.8**  
**JOB HAZARD ANALYSIS (MSFC Form 4390)**

**Job/Task:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Employee (optional):** \_\_\_\_\_ **Supervisor:** \_\_\_\_\_

Org.: \_\_\_\_\_ Location: \_\_\_\_\_

No.	Job Steps	Potential Hazards/Causes	Recommended Controls

### A.3 Review and Approval of the JHA

A.3.1 The JHA shall be reviewed by a team which consists of the supervisor and affected employees.

A.3.2 Any questions with the JHA shall be addressed by the team and resolved.

A.3.3 A final version of the JHA shall be released and maintained on file accessible to the affected employees.

## A.4 Implementing a JHA

A.4.1 Approved and released JHAs shall be reviewed with the entire department (i.e., each employee that the JHA applies to) by the supervisor.

A.4.2 All new employees in the department shall be provided a copy of their applicable JHAs.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 22 of 34

## Appendix B Operating Procedures (OP) Requirements

B.1 Operating procedures for hazardous operations shall consist of the following:

- a. A cover sheet identifying the operation as hazardous
- b. Activity description
- c. Reference documents
- d. Definitions and acronyms
- e. Responsibilities
- f. Safety section
  - List of potential hazards and controls
  - Pretest requirements (i.e., weather restrictions)
  - Emergency telephone numbers
- g. Detailed operating sequences include:
  - Status of switches, valves, etc. before fluid flow or energizing circuit
  - Activity sequences
  - Secure sequences
  - Safety mandatory inspection points
- h. Hazardous area access control
- i. List of required equipment
- j. Provide WARNING, CAUTION, and NOTE statements prior to sequences/steps in which a malfunction or error produces a reaction that causes system degradation or property damage, personnel injury, or death. See below:

<b>WARNING</b>
Maintenance or operating procedures, techniques, restrictions, etc. may result in severe personnel injury, loss of life, or major equipment damage if not followed exactly.
<b>CAUTION</b>
Maintenance or operating procedures, techniques, restrictions, etc. may result in some damage to equipment or system or minor injuries to personnel if not followed exactly.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 23 of 34

**NOTE**

Maintenance or operating procedures, techniques, restrictions,  
etc. require emphasis for safe operation.

- k. Emergency procedures for securing facility and operation when an anomaly occurs (i.e., equipment failure, personal injuries, and fire/explosion).
- l. Schematics, drawings, setup diagrams, etc., as necessary for clarity.
- m. Signature sheet. As a minimum, the signature sheet shall include the name and title of the person submitting the procedure and date signed, and the approval names and date signed of persons responsible for the test and appropriate functional areas (as determined by the program/project manager) and S&MA concurrence..

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 24 of 34

## Appendix C Hazard Analysis (HA) Preparation

C.1 Hazard Analyses shall be conducted using the following procedures.

C.1.1 Gather Data. Identify information and data resources pertinent to the system design, configuration, operation, and safety requirements. Identify cognizant personnel through whom data and information may be obtained and collect the actual documentation that details the design, configuration, and operations. Use information contained in design documents, performance specifications, operation documents, engineering drawings, schematics, or presentation materials.

C.1.2 Learn the System. Read and study the data gathered. Ask questions of key technical personnel to aid in understanding the system. In addition, understand the safety requirements of the system.

C.1.3 Define the Scope of the Analysis. Decide what needs to be analyzed. Determine the level of analysis detail. Ensure the analysis is focused at a manageable level.

C.1.4 Identify Hazards: Use previous knowledge and experience for hazard identification guideline listings to provide a methodology for recognizing hazards, recommending controls, specifying technical requirements, and utilizing good safety design practices. Reference established system safety standards, i.e., MIL-STD-882, NASA-STD-8719.7.

C.1.5 Perform the Analysis. Describe each hazard as a source, trigger, and result. *For example, flammable gas release near unguarded ignition source results in loss of property or death due to fire.* Assign severity of worst credible result and probability of that result to the hazard to establish a Risk Assessment Code. Use the definitions in the following tables. Consider phases of operation and exposure duration when assigning probability. Identify any assumptions on which these values are based.

Table C.1.4.1 HAZARD SEVERITY		
Class	Hazard Category	Definition
I	Catastrophic	May cause a permanent disabling or fatal injury to personnel, and/or loss of facilities, major systems, or associated hardware.
II	Critical	May cause severe injury or occupational illness, and/or major damage to facilities, systems, or hardware.
III	Marginal	May cause minor injury or occupational illness, and/or minor damage to facilities, systems, or hardware.
IV	Negligible	May cause first aid injuries or occupational illness, and/or minimal damage to facilities, systems, or equipment.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 25 of 34

Table C.1.4.2 HAZARD PROBABILITY		
Level	Frequency of Occurrence	Definition
A	Frequent	Likely to occur immediately
B	Probable	Probably will occur in time
C	Occasional	May occur in time
D	Unlikely	Unlikely to occur
E	Improbable	Extremely unlikely

Table C.1.4.3 RISK ASSESSMENT CLASSIFICATION				
Probability	Hazard Categories			
	I Catastrophic	II Critical	III Marginal	IV Negligible
A-Frequent	1A	2A	3A	4A
B-Probable	1B	2B	3B	4B
C-Occasional	1C	2C	3C	4C
D-Remote	1D	2D	3D	4D
E-Improbable	1E	2E	3E	4E

Note: S&MA shall concur in modifications to these definitions.

C.1.6. Identify Recommendations and Controls: Identify recommended controls to eliminate the hazard or reduce the hazard severity and probability of occurrence to an acceptable level.

C.1.7 Assign Residual RAC: Indicate the hazard severity and probability after all the recommendations are incorporated.

C.1.8 Obtain appropriate level of Risk Acceptance: Obtain or ensure the appropriate level of management has accepted the residual risk.

Table C.1.7.1 Risk Acceptance Level	
Severity-Probability	Acceptance Level
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable
1D, 2C, 2D, 3B, 3C	Undesirable, documented acceptance from Director of responsible organization required
1E, 2E, 3D, 3E, 4A, 4B	Acceptable with documented approval from responsible department/program/project/facility manager
4C, 4D, 4E	Acceptable without review

C.1.9 Document the Analysis. Items to be documented include:  
(NASA-STD-8719.7, Appendix A provides a sample hazard analysis worksheet)

- System/Subsystem: Identify the equipment being analyzed.
- Operation: Define the operation being performed when the hazard is identified.

**CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 26 of 34

- c. Hazard Number: An assigned designator used to reference each identified hazard.
- d. Hazard Description: Defines the potential hazard associated with a particular hazard category and describe tasks and procedures that may cause hazards or hazardous conditions.
- e. Initial Risk Assessment Classification (RAC): Defines the hazards severity and probability prior to performing mitigation actions to eliminate or control the hazard.
- f. Recommendations/Existing Controls: Identify recommended controls to eliminate the hazard or reduce the hazard severity and probability of occurrence to an acceptable level.
- g. Residual RAC: Indicate the hazard severity and probability after all the recommendations are incorporated.
- h. Risk Acceptance level: Include additional approval documentation as required.
- i. Resolution: Document the controls that have been implemented to control the hazard severity and probability.
- j. Status: Indicate whether the identified hazard is “Open” or “Closed.”

C.1.10 Revise Analysis: Revise analysis as changes occur in the equipment, operation, or environment.

C.2 S&MA concurrence shall be obtained for all hazard analyses prior to beginning operations.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 27 of 34

## Appendix D Operational Readiness Inspection (ORI)

D.1 The ORIC shall be performed to ensure that all hazards are identified and either eliminated, controlled, or acceptance of risk is recommended, and to ensure safe operations relative to personnel and property.

D.2 The ORI shall include reviewing data or performing tasks in the following areas:

### D.2.1 Design Data

D.2.1.1 Interfaces - ensure compatibility of test article to test facility/equipment (physical, functional, materials).

D.2.1.2 Materials - ensure compatibility of medium to system, system to system.

D.2.1.3 Hazards - review facility and system designs to identify hazards and ensure elimination or control of hazards. This includes identification and review of systems and devices for warning and control such as fire detection and suppression systems, leak detection systems, air contamination monitors, blast and shock protection, and lightning protection systems.

D.2.1.4 Safety Factors - ensure appropriate safety factors exist for all structural systems (e.g., fluid piping systems, pressure vessels, and thrust structures).

D.2.1.5 Facility Hazard Analysis and Failure Modes and Effects Analysis (FMEA) - review planned/accomplished facility hazard analyses and FMEAs for adequacy and identify additional reliability or safety analyses if deemed necessary. Ensure proper retention rationale and controls are implemented for all failure modes and hazards.

D.2.1.6 Process Hazard Analysis – review process hazard analyses for highly hazardous chemicals as defined in OSHA 29 CFR 1910.119, “Process Safety Management of Highly Hazardous Chemicals,” for adequacy. Ensure proper retention rationale and controls are implemented for all hazards.

D.2.1.7 Specifications - ensure proper application of controlling specifications and standards for all critical systems and operations (e.g., welding, cleaning, hazardous and toxic materials, etc.).

D.2.1.8 Performance - ensure the facility affords the ability to control and monitor the test or operation in a safe mode.

D.2.1.9 Support Services - ensure that support services such as electrical power are adequate for safe conduct of the planned tests or operations.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 28 of 34

## D.2.2 Construction and Installation

D.2.2.1 Configuration - ascertain that all new or modified facilities conform to approved design documentation and deviations are properly documented and dispositioned. Ascertain that the configuration of the facility is established and adequate configuration controls shall be maintained.

D.2.2.2 Quality Control/Inspection - review quality controls and inspections that were exercised during the procurement, receiving, in-process inspection of the construction, installation, and checkout phases, including adequacy and maintenance of inspection records, disposition of nonconformances, log books, etc.

D.2.2.3 Facility Inspection - as a minimum, conduct a facility inspection at 75 percent completion and at 100 percent completion of new facility construction or existing facility modifications.

D.2.2.4 Personnel Qualification - ascertain that fabrication and assembly personnel such as welders are qualified and, if required by MWI 3410.1, "Personnel Certification Program," are certified.

## D.2.3 Activation and Operation

D.2.3.1 Plans and Procedures - review all plans and procedures for activation, checkout, and tests or operations. Plans shall be reviewed to ensure that appropriate tests are planned that result in a high level of confidence in the integrity of the facilities and systems prior to initiation of testing or operations.

D.2.3.2 Personnel Qualifications and Training - evaluate the adequacy of the experience and training of the operating personnel. Personnel performing operations which require MSFC certification are certified per MWI 3410.1, "Personnel Certification Program." If additional training is required, the ORIC assists the director/manager in establishing the training requirements and retains completion of training as a constraint to activation as appropriate.

D.2.3.3 Change Control - ensure that a system exists to control changes to the facility, Ground Support Equipment (GSE), technical systems, and procedures so the safety of personnel and operations shall not be compromised.

D.2.3.4 Work Control - review the adequacy of procedures for controlling all work on the facility, GSE, and test article. Shift change procedures shall also be reviewed.

D.2.3.5 Safety and Health - ensure compliance with NASA, OSHA, and applicable Federal, State, and local regulations pertaining to safety and health.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 29 of 34

D.2.3.6 Other areas, tasks, data, etc. as deemed necessary by the ORIC.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 30 of 34

## Appendix E

### Test Readiness Review or Operational Readiness Review (TRR/ORR)

E.1 The TRR or ORR shall perform the following activities:

E.1.1 Review the operational requirements and determine the ability of the facility to meet requirements. Ascertain that adequate configuration control has been implemented. Review test team staffing plans and training/certification.

E.1.2 Review the safety assessment and evaluate the effectiveness of steps taken to mitigate hazards. Summarize the risks in three separate categories and judge the acceptability of incurring these risks to accomplish objectives:

- (1) Risk of major damage to the facility.
- (2) Risk of damage to the test article.
- (3) Risk to personnel.

E.1.3 Determine the adequacy of safety procedures and shutdown modes. Review the list of all procedures needed to perform the test operation. Review test procedures to the extent necessary. Review any open action items and assign action items as needed.

E.1.4 Decide whether or not to conduct test operations.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 31 of 34

## Appendix F Inventory of Hazardous Operations (IHOPS) Database

F.1 The supervisor shall ensure that the following data is entered in IHOPS:  
(The IHOPS URL is - [https://msfcsma3.msfc.nasa.gov/s&ma\\_01/i hops/index.htm](https://msfcsma3.msfc.nasa.gov/s&ma_01/i hops/index.htm) )

F.1.1 The hazardous operation being performed.

F.1.2 A description of the hazardous operation.

F.1.3 The location of the hazardous operation (e.g. Building/Room number, or description of outside location).

F.1.4 The Submitting Organization associated with the hazardous operation (Department level organizational code).

F.1.5 The Supporting Organization that actually performs the hazardous operation.

F.1.6 Information as to whether or not a waiver/deviation has been granted for the hazardous operation. If there was no waiver/deviation granted then simply input "No". If there was a waiver/deviation granted for the hazardous operation then input "Yes", and the following information:

F.1.6.1 The waiver/deviation title.

F.1.6.2 The waiver/deviation start date.

F.1.6.3 The waiver/deviation end date.

F.1.6.4 Any additional notes that may be necessary for clarification.

F.1.7 The total number of personnel supporting this hazardous operation.

F.1.8 The Risk Indicator (RI) level.

F.1.9 Documentation required for the hazardous operation (e.g., HA, OP, JHA, PPE Assessments, etc.) Required fields are indicated by (\*) asterisk marks. If documentation is required for the hazardous operation then the following information should be entered into the IHOPS database:

F.1.9.1 The document date. (e.g., JHA date, HA date, etc.)

F.1.9.2 The document title.

**CHECK THE MASTER LIST at <https://repository.msfc.nasa.gov/directives/directives.htm>  
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE**

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 32 of 34

F.1.9.3 The Records POC. This is the person who maintains this documentation. The information should include the POC's name and phone number.

F.1.10 The Point of Contact (POC) associated with the hazardous operation. The information should include the POC's name and phone number. This POC may be different from the Records POC.

F.1.11 Additional Information/Rationale. This is a comment field for the user to put any other pertinent information that the Reviewer may need. For existing hazardous operations (prior to 2002) that do not have documentation of an HA, ORI, SRT, TRR, or ORR, the user shall provide reasonable rationale in this field. PPE assessments are required for all hazardous operations.

F.1.12 Other Information as necessary. The IHOPS database has fields that list the following information: Area Manager, Safety Representative, Secondary Representative, Reviewed By, Building Manager, and Date of Last S&MA Review. This information is automatically generated by the IHOPS database.

F.1.13 The Supervisor or designated POC completes the checklists associated with the hazardous operation, as required. They may also check the appropriate field if the checklists are not applicable to the type operation listed.

F.1.13.1 The checklists are requirements taken from OSHA standards. They are not mandatory, but may be used as tools to help the user if there are no written procedures for the hazardous operation.

F.1.13.2 If all the answers to the checklists are "Yes" and there are no apparent concerns, then there is no further action required for these checklists.

F.1.13.3 If there are "No" answers to the checklists questions, then the Submitter, with the help of the Reviewer, shall verify that adequate interim hazard controls are in place. The Reviewer works with the Submitter to document the corrective action necessary to rectify the problem, and specify a target date. They both work together to correct the problem within the specified timeframe.

F.1.13.4 Once the Reviewer has accepted the IHOPS entry, no further action is required by the Submitter or the Reviewer until the "Date of Next Inventory" that is generated by the system or changes occur which affect the validity of the IHOPS entry. All system entries should be reviewed and updated annually.

Marshall Work Instruction QD01		
Ground Operations Safety Assessment and Risk Mitigation Program	MWI 8715.15	Revision: B
	Date: October 15, 2004	Page 33 of 34

## Appendix Z Guidance

Z.6.4 One JHA can be used for multiple employees performing the same operations. A supervisor may use a matrix that cross-references JHAs to individual employees. Existing JHAs may be used (see the JHAs on the MSFC SHE Web Page) or unique JHAs can be developed. To submit a JHA to the JHA Library, contact your S&MA representative. Sharing your JHA saves Center resources. When preparing a JHA, mishap history or the potential for a mishap, equipment reconfiguration, procedure changes, or the addition of new employees in the work area should be considered.

JHAs do not require concurrence by S&MA but may be requested and reviewed for adequacy during an audit or procedural review.

Z.6.5 PPEA - The RI may be used to help the supervisor determine the amount of risk associated with the hazard in the work area or with the operation.

Z.6.7 HA - In some cases additional analyses may be required i. e. FMEA, FTA, OHA. Consult system safety reference materials for additional guidance.

Z.6.8 ORI - Chairpersons and members of the ORIC are selected, to the extent possible, from organizations/departments without a vested interest in the activity for which the review is being conducted. Members are qualified to provide competent review by technical experience in areas related to the subject of the ORI. ORIC composition normally includes individuals from the responsible program or project office, Facilities Engineering Department, appropriate department or directorate, user, operating or staff representative, and an S&MA representative who serves as a consultant to the ORIC to ensure a complete and thorough review.

Z.10.2 Available NSTC courses relevant to safety assessment and safety-related work practices:

Z.10.2.1 NSTC 020, "Basic System Safety Practice," or an equivalent course for finding hazards and for assessing their safety risk.

Z.10.2.2 NSTC 021, "Advanced System Safety Practice," or an equivalent course aimed at ensuring safety operating risks.

Z.10.2.3 NSTC 005, "Manager's Safety," or an equivalent course that provides an introduction to workplace safety requirements.

Z.10.2.4 NSTC 828, "Hazard and Operability (HAZOP) Analysis Methodology," or an equivalent course that provides an understanding of the HAZOP method of safety analysis.

<b>Marshall Work Instruction QD01</b>		
<b>Ground Operations Safety Assessment and Risk Mitigation Program</b>	<b>MWI 8715.15</b>	<b>Revision: B</b>
	<b>Date: October 15, 2004</b>	<b>Page 34 of 34</b>

Z.10.2.5 NSTC 048, “System Safety for Managers,” or an equivalent course which discusses typical analytical techniques.

Z.10.2.6 NSTC 002, “System Safety Fundamentals,” or an equivalent course that teaches the fundamentals of system safety management and hazard analysis of hardware and operations.

Z.10.2.7 NSTC 008, “System Safety Workshop,” or an equivalent course that teaches hazard recognition and analysis for hardware and operations.